NASA SPACE APPS CHALLENGE 2026

NEXUS//04

You don’t watch a space mission. You fly one.

A free browser game where you design a real science mission to one of four worlds, launch it, run it in orbit and bring the data home.



Planets rendered from NASA-derived maps. Asteroid and game views are AI-generated visuals.

TEAM NEXUS//04

Sneha **Karishma** **Kshitij** **Anttariksha**

Challenge: Space Mission Design Game

▶️ kshitij7737.github.io/astra-nexus

Space science arrives as finished pictures

The decisions that made those pictures possible stay invisible. That is the gap we built for.

POWER ⟷ **MASS**

A bigger battery survives the dark side of the orbit, but it is heavier to launch.

DATA ⟷ **DOWNLINK**

Instruments fill the recorder fast. Science only counts once it reaches Earth.

AMBITION ⟷ **PROPELLANT**

Every extra instrument costs credits, kilograms and the fuel to carry them.

ONE ORBIT AROUND EARTH, IN OUR GAME



35 min

of every 99-minute orbit is spent in Earth’s shadow. The arrays go dark and the spacecraft lives on its battery.

Pick the small battery and HALO browns out every orbit.
The game lets players find that out, then shows them why.

JUDGING CREATIVITY RELEVANCE

Four real targets. One mission control.

Each mission is modelled on a NASA spacecraft and asks a real science question.



ASTRA

ASTEROID APOPHIS

How does a close Earth pass change an asteroid?

340 m

wide rock passing ~32,000 km from Earth on 13 April 2029

Modelled on **OSIRIS-APEX**
Research: **Sneha**



LUNARIS

MOON SOUTH POLE

Where could water ice survive on the Moon?

25 K

in shadowed polar craters in winter (LRO Diviner)

Modelled on **LRO**
Research: **Karishma**



HALO

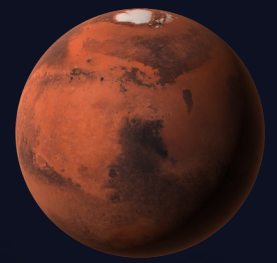
EARTH'S ATMOSPHERE

What do haze, ozone and clouds look like from orbit?

705 km

sun-synchronous orbit, Aura heritage

Modelled on **Terra · Aqua · Aura**
Research: **Kshitij**



JEZERO ECHO

MARS, JEZERO CRATER

What traces remain of an ancient lake?

45 km

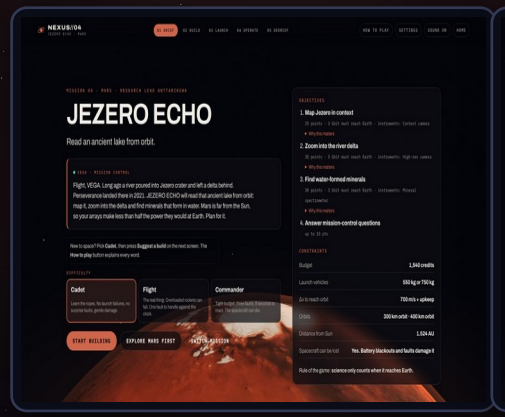
crater that once held a lake and river delta

Modelled on **Mars Reconnaissance Orbiter**
Research: **Anttariksha**

JUDGING RELEVANCE PRESENTATION

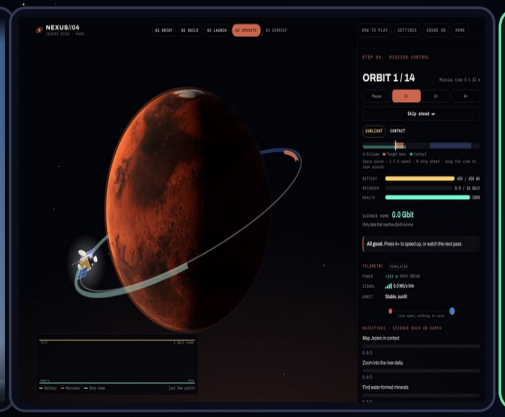
Five stages. Every choice comes back to you.

Brief → Build → Launch → Operate → Debrief.









MISSION GRADE

A

90 / 100
3 of 3 objectives returned to Earth

HALO · Cadet · recommended build

01 Brief

VEGA, the flight director, sets the target and success criteria.

02 Build

Pick arrays, battery, radio, recorder, instruments and fuel.

03 Launch

Every station votes go or no-go, then a full 3D launch.

04 Operate

Fly real orbits: eclipses, passes, contact windows, faults.

05 Debrief

Grade, the physics behind each loss, and a better build to retry.

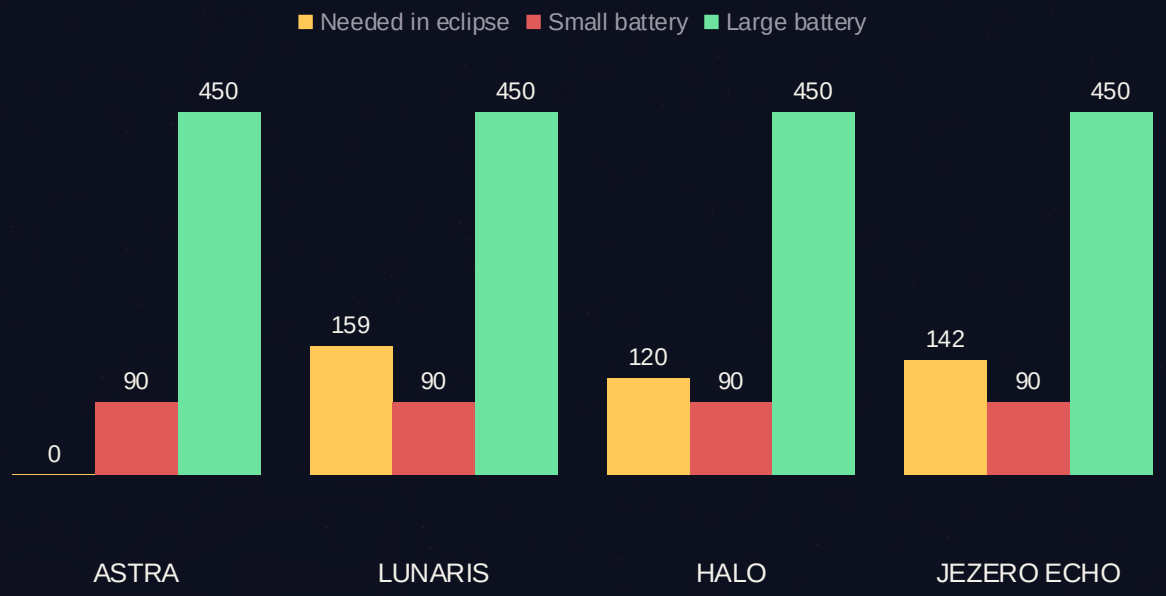
4	worlds to fly	**17**	instruments, each with a real job	**6**	go / no-go checks before launch	**3**	levels: Cadet, Flight, Commander	**0**	installs. Runs in any browser

Game screens: AI-generated visuals

Real physics, and every number is labelled

The game runs orbital mechanics and an energy budget. Nothing is a black box.

BATTERY NEEDED TO SURVIVE ONE ECLIPSE (Wh)



ASTRA never enters shadow at its 20 km standoff from Apophis, so the small battery is enough. At the Moon, Earth and Mars the small battery fails every orbit. Values from the game's own model, usable capacity after 90% efficiency.

HALO AT 705 KM, WORKED BY THE GAME

Orbital period	$T = 2\pi \sqrt{(a^3 / \mu)}$	98.7 min
Time in shadow	$\arcsin(R / a) / \pi \times T$	35.2 min
Energy to survive	205 W × 35.2 min	120 Wh

EVERY VALUE CARRIES ONE OF THREE LABELS

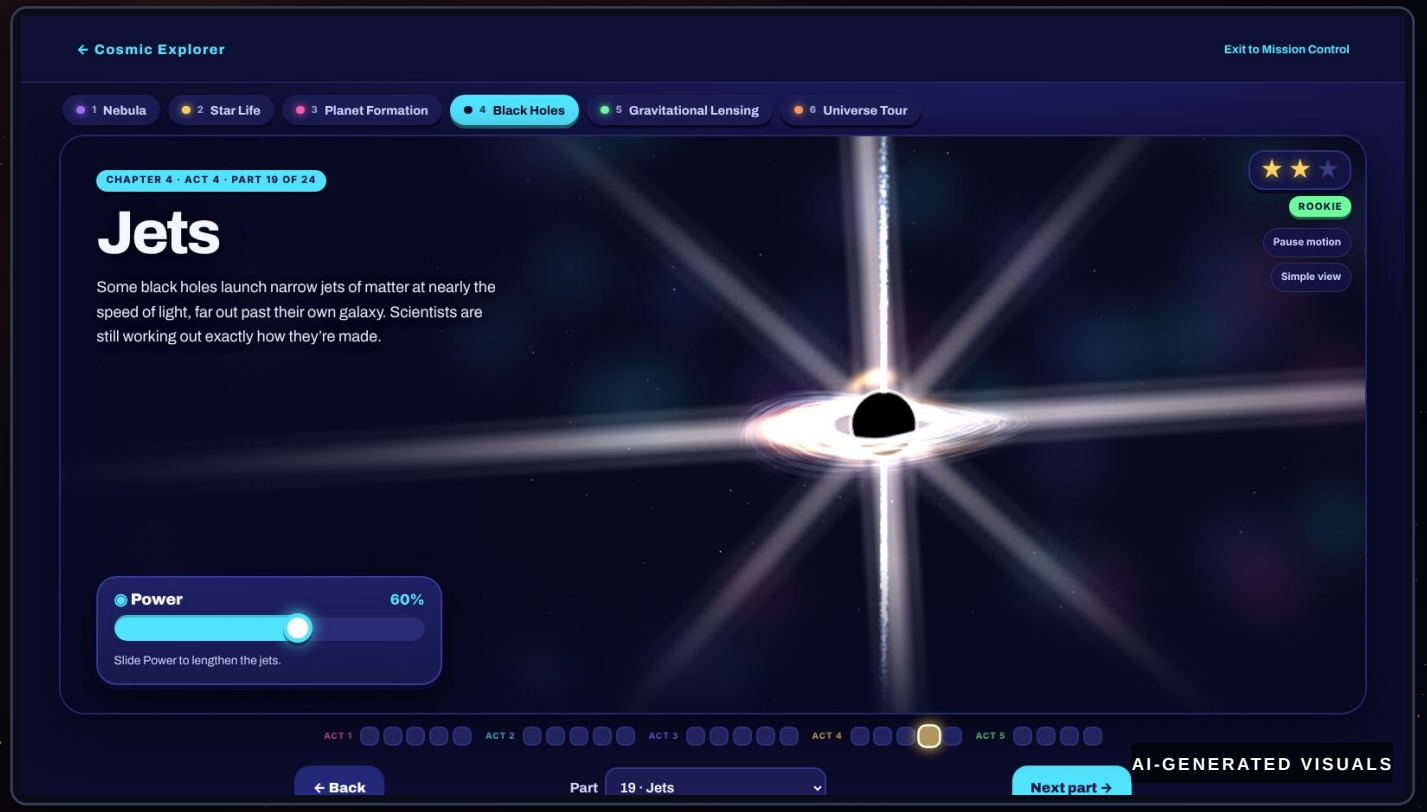
PUBLISHED — Stated by NASA or JPL: Apophis size and pass date, Aura's orbit, LRO crater temperatures

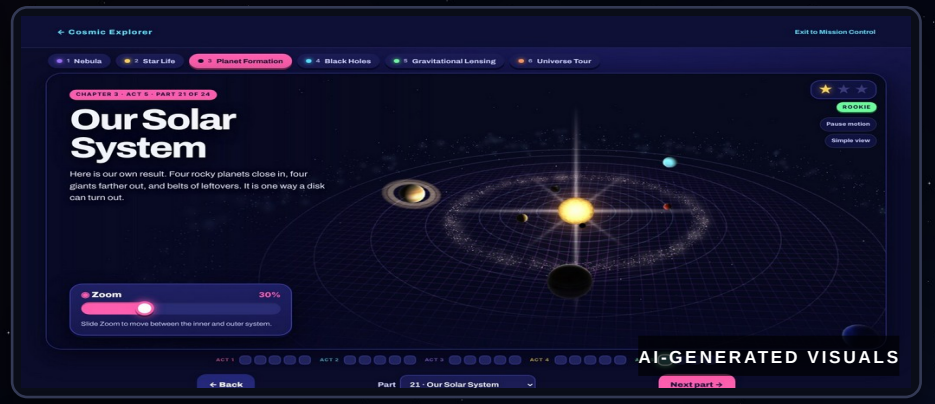
TEAM — From our four research documents: bus mass and power, array derating, efficiencies

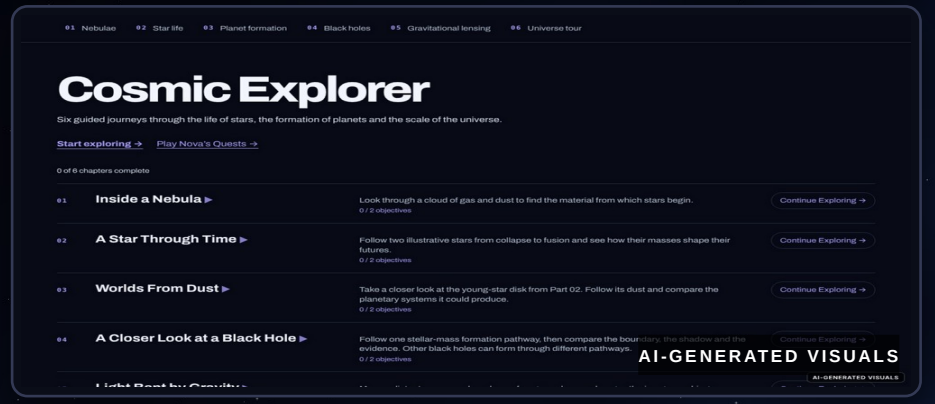
CONCEPTUAL — Chosen for play and marked as such: credits, heater load, fault odds

JUDGING CREATIVITY INFLUENCE

Then zoom out: Cosmic Explorer







NOVA'S QUESTS · BLACK HOLES

RESEARCH: SNEHA

Six interactive story quests turn the missions' science into the bigger picture: how stars are born and die, how planets form, black holes, gravitational lensing and the scale of the universe.

6 chapters

142 interactive parts

426 stars to earn

JUDGING INFLUENCE ALL FIVE CRITERIA

Anyone with a browser can fly a mission

HOW NEXUS//04 MEETS THE JUDGING CRITERIA

Influence	Free, no install, works on phones and school laptops. Built for students and curious beginners.
Creativity	You learn by failing a mission and reading why, not by reading a page. Then Nova's Quests zoom out to the cosmos.
Validity	Kepler orbits, eclipse geometry and energy budgets. Every value labelled published, team or conceptual.
Relevance	A complete mission design game: four targets, five stages, three levels, live today.
Presentation	Cinematic 3D launch, a flight director voice, and a debrief that tells the story of your mission.

PLAY IT NOW

kshitij7737.github.io/astra-nexus

Start with HALO on Cadet. Build, launch, return the science, then try Commander.

Next: classroom trials, and a check that players can explain a trade-off after one mission.

Sneha
ASTRA + Cosmic Explorer research

Karishma
LUNARIS research · integration & QA

Kshitij
HALO research · website development

Anttariksha
JEZERO ECHO research · mission control

Research by the team. Code and visuals generated with AI tools and marked on the site. No NASA endorsement implied.